National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: OI

Office of the Secretary
Federal Communications Commission
1919 M Street NW
Washington DC 20554

Dear Sir:

The National Aeronautics and Space Administration, by way of the enclosure, hereby provides comments on the Petition for Rulemaking RM No. 8837 filed by DSC Communications Corporation.

Sincerely,

David W. Harris
Director, Program Integration Division
Office of Space Communications

Enclosure

NASA
RM No. 8837

September 13, 1996

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20544

In the Matter of	)	
	)	
Wireless Fixed Access	)	
Local Loop Services	)	
	)	RM No. 8837
Petition for Allocation of	)	
Radio Spectrum in the 2 GHz	)	
Band for Provision of	)	
Wireless Fixed Access Local	)	
Loop Services	)	

COMMENTS OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

1. Petition Summary

DSC Communications Corporation proposes to provide Wireless Fixed Access-Local Loop (WFA-LL) services to replace existing drop, distribution and feeder networks of conventional wireline local loops. It is stated that these systems have been designed and are being deployed or tested in numerous countries. Market forecasts provided by Northern Business Information indicate a rapid growth worldwide of this emerging new technology with year 2005 projections of more than 22 million subscribers in North America and over 200 million worldwide. As would be expected, a large percentage of this growth is projected to be in developing countries where access to the telecommunications infrastructure is somewhat limited.

Noting that Commercial Mobile Radio Service (CMRS) and other fixed cellular services are not well suited to providing the full range of Wireless Local Loop (WLL) services and also noting the projected high spectrum congestion in cellular, SMR and PCS allocations, DSC Communications Corp. is proposing the allocation of spectrum in the 2 GHz region for WFA-LL use. Specifically the following paired bands provide the focus of the Petition.

(A) 1668 - 1700 MHz / 1723.5 - 1755 MHz

(B) 2037.5 - 2076 MHz / 2110.5 - 2150 MHz

(C) 2110 - 2145 MHz / 2165 - 2200 MHz

(D) 2160 - 2198.5 MHz / 2310 MHz - 2348.5 MHz.

(E) 2400 - 2438.5 MHz / 2160 - 2198.5 MHz

(F) 2401 - 2439.5 MHz / 2310 2348.5 MHz

In the scheme proposed by DSC Communications Corp., one licensee would be authorized for each designated geographic service area. The system would employ orthogonal CDMA coding to achieve 15 bi-directional user connections for each 3.5 MHz of RF channel. The Petition states that there shall be no limits on effective radiated power or antenna height provided that at the boundary of the licensing area, the licensees ensure that the field strength does not exceed 47 dB above 1 micro volt per meter.

2. Current Allocations in DSC Communications Corp. Proposed Bands

o 1668 - 1700 MHz

In the U.S. and internationally, the band 1660.5 - 1668.4 MHz is allocated to the RADIO ASTRONOMY and SPACE RESEARCH (passive) services on an exclusive basis and Footnote US246 prohibits radio transmissions in this band. The band 1668.4 - 1670 MHz is co-allocated to the RADIO ASTRONOMY, METEOROLOGICAL AIDS, FIXED and MOBILE services. International Footnote 736 cautions against interference to the RADIO ASTRONOMY service. The rest of the 1670 - 1700 MHz is allocated worldwide to a mix of MOBILE SATELLITE (Earth to space in Region 2), METEOROLOGICAL AIDS, METEOROLOGICAL SATELLITE (space to Earth) and, in some portions, FIXED and MOBILE.

o 1723.5 - 1755 MHz

This portion of the spectrum is allocated primarily to the FIXED and MOBILE services with other allocations, in some areas, to the SPACE OPERATIONS service (1750 -1755 MHz) and the METEOROLOGICAL SATELLITE (international) service.

o 2037.5 - 2076 MHz

In the U.S., this band is designated for FIXED and MOBILE use and is used for AUXILIARY BROADCAST and ELECTRONIC NEWS GATHERING (ENG). This band is also allocated via Footnote US90 to the Space Research and Earth Exploration-Satellite services and provides the backbone of the U.S. civilian space programs. NASA and the National Oceanographic and Atmospheric Administration (NOAA) use the band for the command and control of nearly all non-DOD space missions. Internationally, the band is allocated on a primary basis to the SPACE RESEARCH, SPACE OPERATIONS and EARTH EXPLORATION-SATELLITE services and is used as the main spacecraft control link for virtually all space agencies worldwide.

o 2110 - 2145 MHz

In the U.S., the band is allocated to the FIXED and MOBILE services and is reserved via NG153 for use by emerging technologies. Internationally, the 2110 - 2120 portion of the band is allocated to the SPACE RESEARCH (Earth to space) service limited to deep space operations. The rest of the band is allocated to the FIXED and MOBILE services.

o 2165 - 2200 MHz

This band is nationally allocated non-Government FIXED and MOBILE and is reserved via NG153 for future emerging technologies on a co-primary basis. Internationally, the band is allocated to the FIXED, MOBILE and MOBILE SATELLITE (Space to Earth) services

o 2310 - 2348.5 MHz

NASA would like to note that in January 1995, the FCC issued an Allocation Order to re-allocate the 2310-2360 MHz band for satellite delivered Digital Audio Radio in the United States. On June 14, 1995 the Commission adopted an NPRM to establish Rules and Policies for the service. The band is currently used quite extensively for aeronautical telemetry. Internationally, the band is allocated to the FIXED, MOBILE and RADIOLOCATION services.

o 2400 - 2438.5 MHz

This band is allocated to the FIXED, MOBILE and RADIOLOCATION services. The 2400 - 2417 MHz portion of the band has been identified in the U.S. for re-allocation to exclusive non-Government use. The 2417 - 2438.5 MHz portion of the band has been identified for re-allocation for mixed Government/non-Government use. The band 2400 - 2500 MHz is also used for INDUSTRIAL, SCIENTIFIC and MEDICAL uses.

3. Discussion of Frequency Plans A - F

Frequency Plan A ------ 1668-1700 MHz / 1723.5-1755 MHz

Certainly there are spectrum regulation problems in the 1668.5-1668.4 portion of the proposed spectrum as it is exclusively allocated for passive use of the RADIO ASTRONOMY and SPACE RESEARCH (passive) services. Use of this spectrum by WFA-LL would cause certain interference to these sensitive operations.

In the 1668.4-1670 portion, international Footnote 736 states that users "should take all practical steps to protect the RADIO ASTRONOMY service from harmful interference". The radioastronomers use this frequency for Hydroxyl line observations.

Sharing with Earth to space links of the MOBILE SATELLITE service may be difficult for WFA-LL omni antennas. Likewise, abundant use of Local Loops around Meteorological Satellite earth stations may also be problematic to sensitive earth station receivers.

Frequency Plan B ------ 2037.5-2076 / 2111.5-2150 MHz

In the U.S. the band is allocated to the FIXED and MOBILE services and is used extensively used by the AUXILIARY BROADCAST (a form of MOBILE service) to relay remote TV pick-ups back to fixed sites for re-transmission to TV stations. It is not clear as to the sharing possibilities between these two services but the prospect is not promising.

NASA and NOAA have extensive Space Research service operations in the 2037.5-2076 MHz band in support of civilian space programs. Virtually all NASA and NOAA missions are supported via commands sent to the spacecraft on these frequencies both from the TDRSS and from Earth stations. Previous ITU studies of the possibility of frequency sharing between the Space Science Services and high density mobile users such as being proposed have indicated against such sharing. In fact, ITU Resolution 211 recommends that Administrations "do not introduce high-density or conventional type land mobile systems in the 2025-2110 MHz and 2200-2290 MHz bands".

The 2111.5-2150 MHz portion of this Plan has, in fact, been reserved for emerging technologies and, as such, perhaps is a candidate for WFA-LL use. However, the band is also allocated for use by the SPACE RESEARCH service for Earth to space transmissions to deep space spacecraft by either Federal or commercial/non-government users. Although it is unlikely that interference would be caused to spacecraft receivers, interference to Local Loops near transmitting Earth stations would be likely. Protection criteria for receiving SPACE RESEARCH services satellites is contained in ITU-R Recommendation SA.1157.

Frequency Plan C ------ 2110-2145 MHz / 2165-2200 MHz

See Frequency Plan B, for discussion of the 2110-2145 MHz band.

The 2165-2200 MHz band is reserved for non-Government emerging technologies and, as such, is perhaps a candidate for WFA-LL although sharing with the MOBILE SATTELLITE service in the U.S. may be difficult..

Frequency Plan D ------ 2160-2198.5 MHz / 2310-2348.5 MHz

See Frequency Plan C for discussion of 2160-2198.5 band.

The U.S. plans to use the 2310-2348.5 portion of the band for satellite delivered Digital Audio Radio. The band is also used extensively for Government and non-Government aeronautical telemetry operations. On first look, it would not appear that WFA-LL systems would be compatible with these services.

Frequency Plan E ------ 2400-2438.5 MHz / 2160-2198.5 MHz

The 2400-2417 MHz portion of this band has been identified for re-allocation for exclusive non-Government use and, as such, perhaps is a good candidate for WFA-LL.

See Frequency Plan C for discussion of 2160-2198.5 MHz.

Frequency Plan F ------ 2401-2439.5 MHz / 2310-2348.5 MHz

See Frequency Plans E and D for discussions of these bands.

4. Conclusions

Overall, DSC Communications Corp, in selecting candidate frequency bands, appears to have taken into account only some of the users of the radio spectrum in the U.S. and appears not to have considered international users. Since DSC Communications Corp's proposal is for worldwide use of an emerging technology, consideration must be given to the international use of the bands that they propose to use. In particular, NASA would like to draw to the attention of DSC Corp and the Commission the fact that the 2025-2110 MHz portion of the spectrum is used by NASA and NOAA as their primary spacecraft command link for virtually all missions, now and in the foreseeable future. Additionally, the 2110-2120 MHz portion of the spectrum is allocated for use by NASA'S Deep Space Network (DSN) in support of the nation's interplanetary programs. Internationally, the same bands are allocated and used heavily by the space agencies of virtually all nations worldwide.

The 2025-2110 MHz band is allocated internationally on a primary basis to the Space Research, Space Operations and Earth Exploration Satellite services. NASA would like to note ITU Resolution 211, which recommends that Administrations worldwide do not "introduce high density or conventional type land mobile systems in the 2025-2110 MHz and 2200-2290 MHz bands". Also, it should be noted that ITU Working Party Ad Hoc 7B/9D is currently studying issues relating to sharing in this band and that any sharing would have to involve very strict limits on the Local Loop power spectral density. Further, ITU-R Recommendation SA.1154 *Provisions to Protect the Space Research.....Service and to Facilitate the Sharing with the Mobile Service in the 2025-2110 MHz and 2200-2290 Bands*, describes the technical criteria required to protect Space Research operations worldwide and should be noted by DSC Communications Corp. and the Commission in their deliberations.

It should also be noted that NASA operates the Deep Space Network (DSN) in the 2110-2120 MHz portion of the spectrum. The band is used for the command and control of satellites at very large distances from the Earth and thus the transmitted field strengths are quite high. It should be noted that this band is an internationally allocated space band pursuant to ITU Radio Regulations. It's use is on a treaty basis with major implications to those using it contrary to the Regulations. DSC Communications Corp. also needs to be made aware of ITU-R Recommendation SA.1157 *Protection Criteria for Deep Space Research* which defines the technical requirements in order to protect deep space operations worldwide.

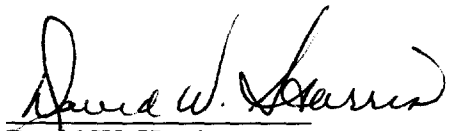
Lacking detailed operational characteristics of the proposed WFA-LL systems, it is not possible to reach conclusions as to the possibility of frequency sharing between WFA-LL operations and the many different services with which DSC Communications Corp. proposes to share. It is, however, disconcerting to NASA that DSC Communications Corp. proposes no limits on effective radiated power and antenna heights. Such use of the spectrum would not allow for effective sharing. NASA has attempted to qualify sharing possibilities in it's response but, of course, without detailed operational characteristics, quantitative sharing assessments cannot be made.

As to the specific frequency plans proposed in the NPRM, NASA is in particular opposition to Frequency Plan B as it would not be possible to accommodate such large numbers (200 million worldwide) of subscribers in a band which is the backbone of the space activities of the U.S. as well for the entire international community. The 2025-2110 MHz band is used by NASA, NOAA and every other space agency in the world as the primary command link to orbiting spacecraft and, as such, cannot be replaced within the time frame being proposed by DSC Communications Corp. for implementation of it's WFA-LL, nor can the two services share the band.

Of the Frequency Plans proposed by DSC Communications Corp., Plan E appears to be the most amenable in terms of frequency sharing (e.g. both links have been identified for use by emerging technologies) although sharing with the MOBILE SATELLITE service in the U.S. may be problematic.

Overall however, NASA feels that a great deal of additional study would be required before such an allocation is made. Certainly more information on technical characteristics of the proposed WFA-LL would be necessary and it would seem incumbent upon DSC Communications Corp. to make a far stronger case before spectrum is allocated to a new service in any portion of the spectrum at this time.

Submitted by:



David W. Harris
OI/Director
Program Integration Division
National Aeronautics and Space Administration
September 16, 1996